

Gunluk 2000-0484

IN THE CLAIMS:

**1. (Currently Amended)** A method carried out in a computer for provisioning rings in a ring-based network having a given topology of nodes and logical links that interconnect said nodes, and a set of traffic demands that is desired for said network to carry, comprising the steps of:

executing a process that identifies a set of feasible rings in said network, which is a subset of all possible rings in said network that satisfy a given constraint;

executing a process of identifying a routing for the traffic demands in said set of traffic demands, ~~while aiming to that minimizes~~ both a number of traffic demands that are not routed and an overall routing metric, where the routing metric is a cost measure that is associated with using one of said logical links in a routing path of a demand;

identifying a set of rings from among a set of feasible rings that minimizes a ring assignments cost measure that includes a cost associated with not covering routed demands with rings and a cost associated with using rings to cover demands; and

outputting the set of rings developed by said step of identifying for provisioning said nodes of said network.

**2. (Currently Amended)** The method of claim ~~2~~ **1** where said constraint requires a feasible ring to have not more than a given number of nodes, and have a mileage cost that is not more than a given mileage cost.

**3. (Original)** The method of claim **1** further comprising the step of provisioning said nodes of said network in accordance with said set of rings developed by said step of identifying.

**4. (Original)** The method of claim **3** where said provisioning is accomplished through electronic transmission of information from said computer to said nodes of said network.

**5. (Original)** The method of claim **1** where said process of identifying a routing for the traffic demands

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- (a) considers a routing path for each of said demands, starting with the demand having a lowest routing path cost, based on a table that identifies a path having a lowest routing path cost for each arbitrary pair of nodes of said network;
- (b) assigns a demand to said path having said lowest routing path cost, if capacity exists on said path having said lowest routing path cost;
- (c) assigns said demand to a path having a higher routing path cost if capacity does not exist on said path having said lowest routing path cost; and
- (d) leaves said demand un-routed if capacity does not exist on any path that can carry said demand, thereby obtaining an identified routing of said demands.

**6. (Original)** The method of claim 1 where said process of identifying a routing for the traffic demands employs a shortest routing path metric

**7. (Original)** The method of claim 1 where said process of identifying a routing for the traffic demands identifies a set of demand routings A by:

- (a) considering a routing path for each of said demands, starting with the demand having a lowest routing path cost, based on a table that identifies a path having a lowest routing path cost for each arbitrary pair of nodes of said network;
- (b) assigning a demand to said path having said lowest routing path cost, if capacity exists on said path having said lowest routing path cost;
- (c) assigning said demand to a path having a higher routing path cost if capacity does not exist on said path having said lowest routing path cost;
- (d) leaving said demand un-routed if capacity does not exist on any path that can carry said demand, thereby obtaining a first identified routing of said demands, B;
- (e) changing order in which said demands are considered and repeating steps (b), (c), and (d) to result in a second identified routing of said demands, C; and
- (f) assigning A=B when number of un-routed demands in B is less than number of un-routed demands in C, and A=C when number of un-routed demands in B is not less than number of un-routed demands in C.

**8. (Original)** The method of claim 7 where said table is pre-computed.

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9. (Original) The method of claim 1 where said step of identifying a set of rings employs an integer linear programming module to obtain said set of rings that minimizes said ring assignments cost function.

10. (Currently Amended) The method of claim 1 where said ring assignments cost function is  $\sum_{j=1}^J c_j x_j + p \sum_{i=1}^I s_i$ , that is minimized subject to  $\sum_{j=1}^J a_{ij} x_j \leq w_i$  for each link  $i$ ,

and  $\sum_{j=1}^J a_{ij} x_j + s_i \geq d_i$  for each link  $i$ , where

$c_j$  = "cost" of a ring in candidate ring family  $j$ ,

$d_i$  = number of units of demand routed on logical link  $i$  of said network, minus the number of available information channels that are already part of,

$a_{ij} = 1$  if ring of family  $j$  employs link  $i$ ; 0 otherwise,

$p$  = penalty amount supplied by a user of said method for not covering a unit of demand on a logical link[[, - one of the parameters supplied by the user to step 101]],

$w_i$  = number of available idle information channels on link  $i$ ,

$x_j$  = number of copies of ring family  $j$  to include in the solution, and

$s_i$  = number of demands not covered on logical link  $i$ .